Letter to the Editor

Tailoring the cure: still science fiction?

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We read with great interest the thought-provoking editorials written by Marini and Bourenne *et al.*, and to all of them goes our deepest gratitude.

We also believe that "acute respiratory distress syndrome (ARDS) " is an extremely broad label which comprehends a great variety of patients affected by remarkably different underlying conditions.

Data from our study strongly suggest that splitting the moderate ARDS group into two subgroups [Mild-Moderate with a PaO_2/FiO_2 ratio measured a 5 cmH_2O of positive end-expiratory pressure (PEEP) between 150 and 200 mmHg, and Moderate-Severe with a PaO_2/FiO_2 ratio measured a 5 cmH_2O of PEEP between 150 and 100 mmHg] defines two populations that seem to differ greatly in many aspects, one of which is surely the response to high pressure ventilation regimens. Indeed, we found a better response to recruitment maneuvers in the moderate-severe subgroup compared to the mild-moderate, and a similar pattern was found in the severe group. However, by applying high pressures, in form of recruitment maneuvers, inhomogeneity was reduced by about 20% in mild-moderate ARDS patients, but this effect was less pronounced in patients with increasing ARDS severity. On the contrary, in more severe ARDS patients, performing recruitment maneuvers was related to a clear worsening of lung inhomogeneity (1).

Moreover, we found that throughout the different severity classes of ARDS, mechanical ventilation was delivered to progressively smaller and more inhomogeneous lungs. When we computed the mechanical power for the ventilations applied to our patients' population, we found that the energy delivered to the respiratory system was pretty similar throughout the classes of ARDS severity (ranging from 21 to 24 Joule/min). But when we normalized those data for the actual lung size, as measured with the CT analysis, what we realized was that in the more severe classes the power delivered was basically twofold higher than the one delivered in the less severe ones (1).

How could then a physician choose the right ventilation for his/her patients? Knowing that Ventilator Induced Lung Injury results from the interaction between the ventilator settings and the condition of the lung parenchyma (size and homogeneity), how could we keep setting the first without really knowing the latter?

We believe that we have the obligation to find better ways to stratify our ARDS patients, in order to better understand their underlying condition, and therefore be able to "give the right cure/ventilation to the right patient". A first step in this direction could be revising the ARDS definition, with criteria that better discriminate different sub-set populations of patients.

In a medical era where it would sound obscene to start a chemotherapeutic treatment without exactly knowing the gene expression of the cancer to be addressed, we intensivist are compelled to find ways to better categorize our patients.

Marini is right, the procedures that allow CT quantitative

analysis are—still nowadays—not readily available to every clinician, because they are extremely time consuming and require quite a steep learning curve. But why should this be the case? Klapsing and colleagues (2) created an elegant computerized algorithm able to give a fast and reliable quantitative CT analysis for over-distended, normally aerated, and poorly aerated lung regions. The application of this algorithm could allow rapid post-CT scan quantitative analysis, allowing the intensivist to know with adequate reliability the lung conditions of his/her patients, and therefore tailoring the "perfect ventilation" for that specific patient.

A simpler and even faster method, yet accurate enough for the clinical setting, is the so-called "visual anatomical analysis" of recruitment CT scans. Indeed, Chiumello and colleagues recently showed that visual anatomical analysis can classify ARDS patients into those with a high or low recruitability with sufficient sensitivity and specificity when compared to CT quantitative analysis (3).

Similarly, we can speculate that soon the Mechanical Power equation (4) will be implemented in ventilators software, allowing to constantly and attentively monitor the total forces delivered to the patients' lungs.

These are just some examples of steps that we believe that our scientific community could easily take at present or in the near future, in order to better tailor the cure for our patients and therefore make it less of sci-fi, and more of an everyday process.

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Footnote

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